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This is a succinct monitoring report on some activities related to *Components Failure and Reliability Modeling* conducted in the CEA/DEN/DM2S. The major part of the activity is conducted in support to Fission Reactor (present & future) Technology. These activities are mainly R&D in Components Failure & Reliability modeling. Still, a minor part of these activities can be immediately used in the Fusion Components Failure & Reliability field. Some tasks have already been identified and proposed in support of the design activities for the Helium-Cooled Lithium Lead (HCLL) blanket both for DEMO and the commercial power reactor (in the Power Plant Conceptual Studies framework) but no progress to monitor in FY-2003 and FY-2004.

Regarding R&D activities relevant to fusion components, I can mention the following activities. Within a Ph.D. research work that I co-direct, we are developing a stochastic model describing different mechanisms of failure in the case of Vessel Structures. Fatigue, rupture and irradiation mechanisms are considered in modeling the rupture of a vessel operating under certain loading conditions of temperature and pressure. The distribution of initial flaws and cracks detection probabilities are integrated in the model as well. For each failure mechanism, the model applies a Markovian or semi-Markovian scholastic modeling procedure. The coupling between different failure mode and the spatial conditions on the vessel is believed to be achieved using Monte-Carlo sampling. We are not yet at this coupling phase of the work.

A particular interest is paid to the effect of neutron irradiation on the structure failure. Some already existing models allow us to correlate neutron fluence and toughness for a given material. However, experimental measurements on irradiated samples are rare and in some case lacking. Accordingly, we are being interested in developing some statistical schemes to improve the quality of the correlations (models) using few experimental measurements. At the moment, we are testing a method to fit "toughness" using 3-parameters Weibull distributions. The quality of the fitting is assessed using Monte-Carlo simulation. This work is directly extended to fusion structure failure modeling using the appropriate neutron fluence.

No progress to monitor regarding JET Failure data collection and treatment.

If I should give a recommendation based on my past 2 years activities in structure failure stochastic modeling, I would recommend including toughness data and toughness-neutron-irradiation data in the database.

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